California Energy Commission

CONSULTANT REPORT

Senate Bill 1 Eligibility Screening of Solar Equipment

June 2014 to June 2017

Prepared for**: California Energy Commission**
Prepared by: **Alternative Energy Systems Consulting, Inc.**

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Primary Author(s):

Ronald K. Ishii, P.E., DGCP, CMVP
Ty Sales, CEM

AESC, Inc.
5927 Balfour Court, Suite 213
Carlsbad, CA 92008
(916) 931-2641
www.aesc-inc.com

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Prepared for:

California Energy Commission

Jim Folkman
Contract Manager

Natalie Lee
Office Manager
RENEWABLE ENERGY OFFICE

Courtney Smith
Deputy Director
RENEWABLE ENERGY DIVISION

Robert P. Oglesby
Executive Director

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ABSTRACT

The California Energy Commission contracted with Alternative Energy Systems Consulting, Inc. to manage the daily requests and inquiries of solar equipment to be considered for inclusion on the Energy Commission's Lists of Eligible Solar Equipment. These lists are required following the Energy Commission's mandate under Senate Bill 1 (Murray, Chapter 132, Statutes of 2006, §4) to establish and maintain eligibility criteria for California's solar electric incentive programs. This final report describes the original purpose, approach, results and conclusions of the work by AESC under Agreement Number 500-13-003. This report further documents issues encountered and recommendations for the Energy Commission's future efforts in maintaining the Lists of Eligible Solar Equipment.

Keywords: SB-1 Guidelines, Energy Commission, solar equipment, PV modules, inverters, meters, other solar electric generating technologies Go Solar California

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EXECUTIVE SUMMARY

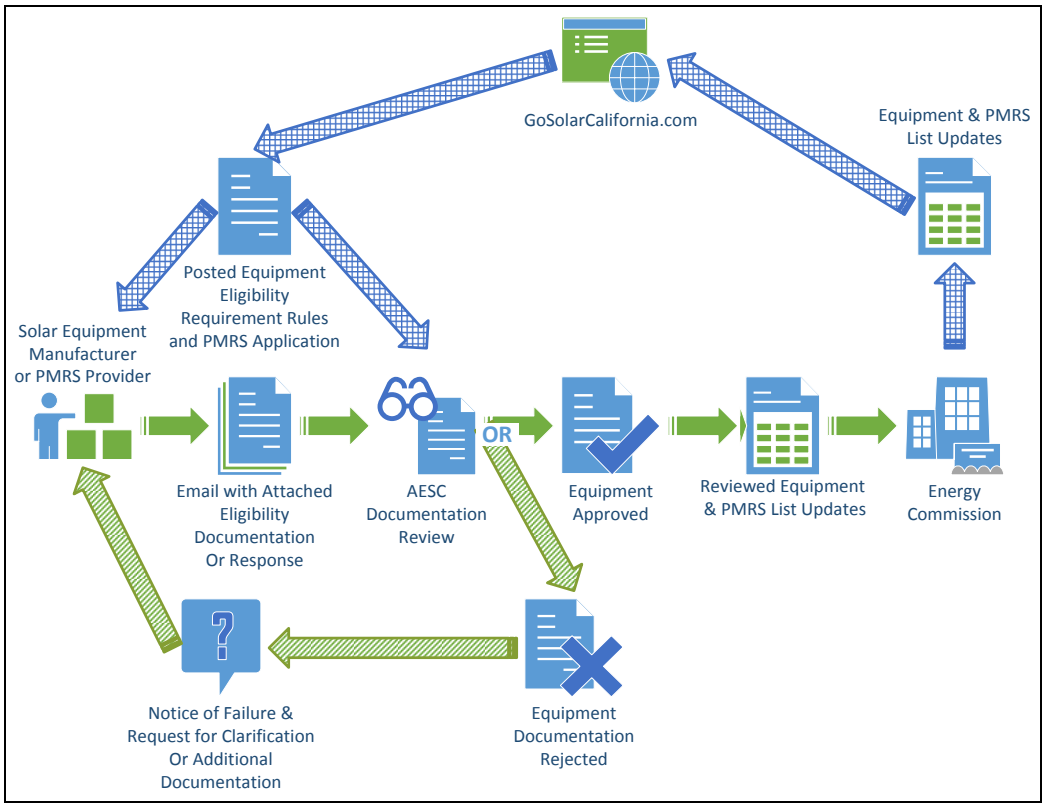
Background

The California Energy Commission's solar equipment eligibility lists fulfill the agency's Senate Bill 1 (Murray, Chapter 132, Statutes of 2006) mandate to establish and maintain eligibility criteria for California's solar electric incentive programs. The solar eligibility lists are updated regularly, typically monthly, and are publicly available on the Go Solar California website at http://www.gosolarcalifornia.org. Alternative Energy Systems Consulting, Inc. (AESC) assisted the Energy Commission from June 2014 through June 2017 in maintain its lists of eligible equipment. AESC efforts included reviewing documentation and evaluating eligibility for the following technologies: solar photovoltaic (PV) modules, inverters, electric production meters, other solar energy-generating technologies, and performance monitoring and reporting service (PMRS) providers. In addition, AESC provided support while the program review activities were transitioned to the Energy Commission staff on May 16, 2017.

Eligibility Criteria and Review Process

Eligibility criteria are published on the Go Solar California website to inform equipment manufacturers of the requirements and needed documentation. Applications for equipment eligibility are accepted at all times; however, only those submitted prior to the 15th of each month are considered for the following month's update. AESC established processes to accept documentation from equipment manufacturers through a central email address, review the documentation, request additional information, and submit a revised eligible equipment list to the Energy Commission by the 25th of the month, to allow Energy Commission staff review before the subsequent monthly update. Figure 1 illustrates the overall process.

Figure 1 - Solar Equipment Eligibility Review Process



Source: Alternative Energy Solutions Systems Consulting, Inc. & California Energy Commission

Lessons Learned

Several observations were made by AESC over the contract period. The primary observations are listed below.

- The eligibility review process is well tolerated by solar equipment manufacturers. They appear willing, if not eager, to have their equipment vetted and posted publicly.
- The 15 percent rejection rate for initial submissions is reduced to nearly zero for subsequent revised submissions.
- The review process could be streamlined.
- There are challenges managing eligible equipment obsolescence, tracking base equipment for multiple listings, and searching the large PV module list. “Base” equipment is the original make and model already listed on the Eligible Equipment Lists.
- Equipment manufacturers are not always consistent with their submittal of documentation, resulting in delays and additional review time.
- Some Energy Commission internal parameter checks are not publicly available and may need to be updated. For example, some parameter checks are not aligned with improvements in technology.

Recommendations

The following recommendations are provided to reduce costs, increase accessibility and manageability, and enhance the utility and value of the equipment lists.

- Develop Web-based electronic data entry input forms to be completed by manufacturers to reduce staff effort and time spent on maintaining the equipment lists. The forms should include checks for data integrity and eligibility limits. The data would be automatically entered into a database and, following successful and thorough eligibility review, released directly into the public eligible list.
- Consider making the lists and equipment performance parameters available via a Web service or simple application program interface (API) to simplify the use of the lists by external automated systems.
- Add data fields to the master list to track entry date and revision date(s) and identify base equipment for multiple listings. "Base" equipment is the original make and model already listed on the Eligible Equipment Lists.
- List users are not aware when the lists are updated. Provide a blog or comment posting from the Energy Commission to notify manufacturers and the public when an update has occurred.
- Develop enhanced processes for removing discontinued equipment, with safeguards to lessen any impacts to other users of the equipment lists.
- Survey manufacturers and users to determine the value of the eligible equipment lists, better understand the needs and purpose of maintaining the lists, and solicit input and feedback from stakeholders.
- Make the eligible equipment lists available within an online searchable database.
- Revisit and update the parameter checks to ensure they are currently applicable and then inform the public, For example, the power temperature coefficient value is outdated and should be updated to reflect current equipment and technology.
- Consider moving the equipment documentation submission due date to the beginning of the month for updates in the following month. This will allow additional time to review and resolve issues prior to the next update.

Energy Commission's New Equipment Request Form Feedback

AESC assisted the Energy Commission in developing the new equipment request forms and provided feedback in the form of an email or a separate word document summarizing the recommendations. The feedback was both for the development of the new form and suggestions for the review of the submittals. Here is an example of some of the feedback for PV module requests:

The flow of submittals should follow what they have been accustomed to old process.

The goal was to put all the manual entry on the manufacturer, and AESC believes that the new PV equipment request form does that. AESC advises Energy Commission staff to consider the following when reviewing requests:

- Verify that the laboratory tested model (LTM) data were entered correctly from the submitted test report.
- Verify that the LTM meets the applicable SB 1.
- Verify the PV manufacturer name is consistent.
- Verify there are no marketing terms used in description.
- Verify the UL 1703 Authorization To Mark contains the submitted PV modules requested.
- Verify the test report is from a Nationally Recognized Test Laboratory or International Laboratory Accreditation Cooperation (ILAC).
- Verify the submittal was from the manufacturer.
- Verify the manufacturer isn't using a white backsheet test report to add a black backsheet PV module.
- Always insist on a correlation between existing base module(s) and the multiple listed module(s).

CHAPTER 1:
Contract Background and Purpose

Background

Senate Bill 1 (Murray, Chapter 132, Statutes of 2006), was enacted in 2006 with the goals of installing solar energy systems with a generation capacity equivalent of 3,000 megawatts (MW), establishing a self-sufficient solar industry in 10 years so that solar energy systems are a viable mainstream option for homes and commercial buildings, and, within 13 years, putting solar energy systems on 50 percent of new homes. The overall goal of California's Solar Initiative (CSI) Program was to help build a self-sustaining solar electricity market combined with improved energy efficiency in the state's residential and nonresidential buildings.

Under SB 1, the Energy Commission maintains lists of solar photovoltaic modules, inverters, system performance meters, other solar electric generating technologies (OSEGT) and performance monitoring and reporting services (PMRS).[1] These lists help determine what equipment is eligible to receive incentives through the New Solar Homes Partnership (NSHP) and solar energy incentive programs overseen by the California Public Utilities Commission (CPUC) and publicly owned utilities (POUs).

Under Contract #500-13-003-01, Alternative Energy Systems Consulting, Inc. (AESC) provided the Energy Commission technical assistance in maintaining the lists of eligible equipment for the following technologies: solar photovoltaic (PV) modules, inverters, electric production meters, OSEGT, and PMRS providers. Later in the contract period, training was added to help transition the review to Energy Commission staff.

SB 1 Equipment Eligibility Requirements

SB 1 directs the Energy Commission to establish statewide guidance for eligibility criteria, conditions for incentives, and rating standards for projects applying for ratepayer-funded incentives for solar energy systems. Each program administrator can establish specific rules for their program, but within the guidance parameters of SB 1. The *Guidelines for California's Solar Electric Incentive Programs* (Senate Bill 1), published by the Energy Commission, establish minimum guidelines to implement California's solar energy system incentive programs overseen by the Energy Commission, the CPUC, and the POUs.[2] The document also details eligibility requirements for PV modules, OSEGT, inverters, metering and PMRS providers. These requirements are described in the following subsections.

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1 ibid

2 The California Energy Commission's Senate Bill 1 page is found at: http://www.energy.ca.gov/sb1/

Photovoltaic Modules (PV Modules)

PV modules typically consist of PV cells that are electrically wired together and laid flat usually with a nonconducting backing and transparent glazing contained within a metal or plastic frame to create a module unit that is suitable for outdoor mounting. PV cells can be made from silicon, amorphous silicon[3], or nonsilicon materials, such as cadmium telluride. Multiple PV modules can be arranged and wired together to form a solar array.

Eligible PV modules are required to provide testing data from independent laboratories to ensure safety and high-quality data on module performance in the field. These data are also used to calculate the expected performance of the system.

Inverters

The "Performance Test Protocol for Evaluating Inverters Used in Grid Connected Photovoltaic Systems"[4] to determine inverter performance data is required in addition to product certification indicating compliance with UL 1741 from a Nationally Recognized Testing Laboratory (NRTL).[5] The inverter test protocol requires the reporting of efficiency data at the full range of operating conditions (power and efficiency at the full range of possible voltages), along with the nighttime tare loss for each inverter to provide full performance information and enable hourly estimating of the overall performance of the system.

Meters

Electric meters are used to measure the output of solar generators. Performance meters, whether stand-alone or integrated with the inverters, shall be required to meet the eligibility criteria set forth by the SB 1 Guidelines.

Other Solar Electric Generating Technologies (OSEGT)

OSEGT products are solar systems that generate electricity but do not consist of flat photovoltaic panels. They must have a product safety certification from a NRTL. An evaluation to determine whether any existing standards or portions of existing standards are applicable, and/or whether development of new test protocols is necessary, shall be performed by a NRTL. Any necessary development of new test protocols shall be performed by an NRTL. Manufacturers shall submit all new test protocols to the Energy Commission for review. The Energy Commission reserves the right to challenge the adequacy of test protocols for incentive eligibility. If inadequacies are

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3 Amorphous silicon (a-Si) is the non-crystalline form of silicon used for solar cells and thin-film transistors in LCD displays

4 Bower, Ward, Whitaker, Chuck, Erdman, William, *Performance Test Protocol for Evaluating Inverters Used in Grid Connected Photovoltaic Systems,"* http://www.gosolarcalifornia.ca.gov/equipment/documents/2004-11-22_Test_Protocol.pdf.

5 OSHA's Nationally Recognized Testing Laboratory (NRTL) program recognizes private sector organizations to certify certain products to ensure that they meet the requirements of both the construction and general industry OSHA electrical standards. Each NRTL has a scope of test standards that it is recognized for, and each NRTL uses its unique registered certification mark(s) to designate product conformance to the applicable product safety test standards.

determined, the Energy Commission will consult the NRTL and manufacturer but may ultimately determine that the equipment is not eligible for an incentive if inadequacies are not resolved.

Performance Monitoring and Reporting Service (PMRS) Providers

Under the California Solar Initiative, PMRS[6] providers provide reports of installed solar equipment performance to host customers and system owners. Entities wishing to become eligible PMRS providers must complete an application that certifies that they are fully compliant in all respects with the PMRS requirements as defined in the California Solar Initiative Program, including the technical requirements for data handling and reporting. The CSI Program and CSI Handbook are managed by the California Public Utilities Commission and are a component of the SB 1 Program.

Energy Commission's Lists of Eligible Solar Equipment

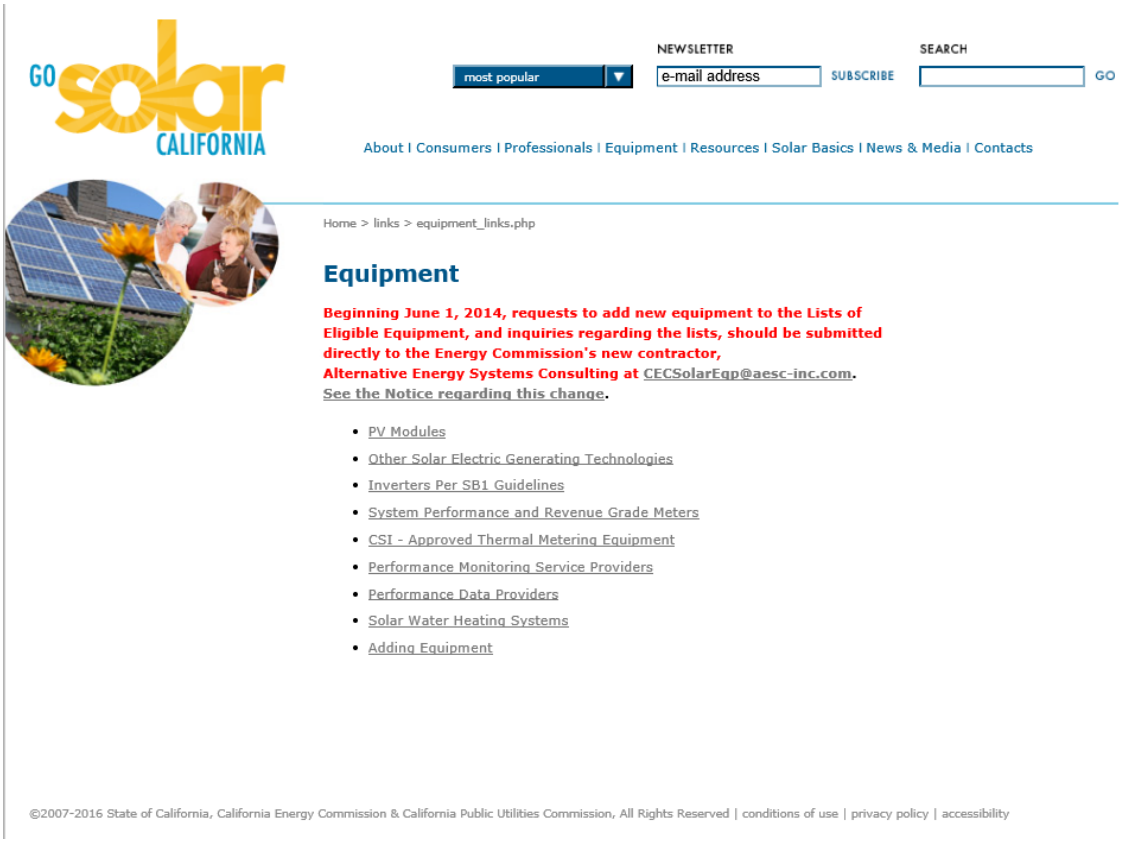
The Go Solar California campaign is a joint effort of the California Energy Commission and the California Public Utilities Commission. The goal is to encourage Californians to install 3,000 megawatts of solar energy systems on homes and businesses by the end of 2016, making renewable energy an everyday reality. The program also has a goal to install 585 million therms of gas-displacing solar hot water systems by the end of 2017.

The Go Solar California website provides California consumers a "one-stop shop" for information on solar programs, rebates, tax credits, and information on installing and interconnecting solar electric and solar thermal systems. The site has information on program rules, including eligible equipment and standards, as well as information on how to find an eligible, licensed solar contractor.

6 Performance monitoring and reporting service (PMRS) providers are a requirement of the California Solar Initiative. These providers collect data and report performance of incented solar systems. It is also used by the Self-Generation Incentive Program to qualify reporting entities for performance based incentives.

Part of the Go Solar California website is dedicated to listings of Energy Commission's eligible solar equipment including, but not limited, to PV modules, inverters, meters, OSEGTs and PMRS providers. It also provides instructions to manufacturers and PMRS providers on how to get their equipment or services listed. A screenshot of the eligible equipment section of the website is shown in Figure 2.

Figure 2: Eligible Equipment Section of the Go Solar California Website



Source: Solar Equipment Webpage: http://www.gosolarcalifornia.org/equipment/index.php

The eligible PV Modules list consists of models listed by manufacturer name, module model number, a short description, whether it is considered BIPV, and the rated PTC.[7] As of June 1, 2017, the module list consists of 20,402 PV models. A portion of the PV module list posted in the Go Solar California website is shown in Figure 3.

Figure 3: Portion of Posted Eligible PV Modules

Manufacturer Name	Module Model Number	Description	BIPV*	PTC*	Notes
A10Green Technology	A10J-S72-175	175W Monocrystalline Module	N	151.2	
A10Green Technology	A10J-S72-180	180W Monocrystalline Module	N	155.7	
A10Green Technology	A10J-S72-185	185W Monocrystalline Module	N	160.2	
A10Green Technology	A10J-M60-220	220W Polycrystalline Module	N	189.1	
A10Green Technology	A10J-M60-225	225W Polycrystalline Module	N	193.5	
A10Green Technology	A10J-M60-230	230W Polycrystalline Module	N	204.1	
A10Green Technology	A10J-M60-235	235W Polycrystalline Module	N	208.7	
A10Green Technology	A10J-M60-240	240W Polycrystalline Module	N	213.3	
A2Peak Power	POWER ON P220-6x10	220W Polycrystalline Module	N	195.0	
Aavid Solar	ASMS-165P	165W Polycrystalline Module	N	146.3	
Aavid Solar	ASMS-180M	180W Monocrystalline Module	N	159.7	
Aavid Solar	ASMS-185M	185W Monocrystalline Module	N	164.3	
Aavid Solar	ASMS-220P	220W Polycrystalline Module	N	196.6	
Aavid Solar	ASMS-225M	225W Monocrystalline Module	N	200.9	
Aavid Solar	ASMS-230P	230W Polycrystalline Module	N	206.9	
Aavid Solar	ASMS-235M	235W Monocrystalline Module	N	210.0	
Aavid Solar	ASMS-270P	270W Polycrystalline Module	N	244.4	
Aavid Thermalloy	ASMP-175M	175W Monocrystalline Module	N	154.0	
Aavid Thermalloy	ASMP-180M	180W Monocrystalline Module	N	158.6	
AblyTek	5MN6C175-A0	175W Monocrystalline Module	N	151.2	
AblyTek	5MN6C180-A0	180W Monocrystalline Module	N	155.7	

Source: Example from List of PV Modules located at: http://www.gosolarcalifornia.org/equipment/pv_modules.php

7 *PTC* refers to PVUSA Test Conditions, which were developed to test and compare PV systems as part of the PVUSA (Photovoltaics for Utility Scale Applications) project. PTC are defined as 1,000 watts per square meter solar irradiance, 20 degrees C air temperature, and wind speed of 1 meter per second at 10 meters above ground level. PV manufacturers typically use Standard Test Conditions, or STC, to rate their PV products. STC are defined as irradiance intensity of 1000 W/m^2, AM1.5 standard reference spectrum, and cell or module temperature of 25 ± 2 degrees C.

The eligible inverter list consists of the manufacturer name, inverter model number, a short description, power rating, weighted efficiency and whether it has an approved built-in meter. As of May 17, 2017, the inverter list consists of 2,775 models. A portion of the eligible inverter list posted in the Go Solar California website is shown in Figure 4.

Figure 4: Portion of Posted Eligible Inverters

Manufacturer Name	Inverter Model number	Description	Power Rating (Watts)	Weighted Efficiency	Approved Built-in Meter	Notes
ABB	MICRO-0.25-I-OUTD-US-208	250W Utility Interactive Inverter	250	96	Yes	NA
ABB	MICRO-0.25-I-OUTD-US-240	250W Utility Interactive Inverter	250	96	Yes	NA
ABB	MICRO-0.3HV-I-OUTD-US-208	300W Utility Interactive Inverter	300	96	Yes	NA
ABB	MICRO-0.3HV-I-OUTD-US-240	300W Utility Interactive Inverter	300	96	Yes	NA
ABB	MICRO-0.3-I-OUTD-US-208	300W Utility Interactive Inverter	300	96	Yes	NA
ABB	MICRO-0.3-I-OUTD-US-240	300W Utility Interactive Inverter	300	96	Yes	NA
ABB	PVI 3.0 OUTD-S-US-Z-M (208 V)	3 kW (208Vac) Utility Interactive Inverter with meter	3000	96	Yes	NA
ABB	PVI 3.0 OUTD-S-US-Z-M (240 V)	3 kW (240Vac) Utility Interactive Inverter with meter	3000	96	Yes	NA
ABB	PVI 3.0 OUTD-S-US-Z-M (277 V)	3 kW (277Vac) Utility Interactive Inverter with meter	3000	96	Yes	NA
ABB	PVI 3.0 OUTD-S-US-Z-M-A (208 V)	3 kW (208Vac) Utility Interactive Inverter with arc-fault detection and meter	3000	96	Yes	NA
ABB	PVI 3.0 OUTD-S-US-Z-M-A (240 V)	3 kW (240Vac) Utility Interactive Inverter with arc-fault detection and meter	3000	96	Yes	NA
ABB	PVI 3.0 OUTD-S-US-Z-M-A (277 V)	3 kW (277Vac) Utility Interactive Inverter with arc-fault detection and meter	3000	96	Yes	NA

Source: Example from List of Eligible Inverters located at: http: http://www.gosolarcalifornia.org/equipment/inverters.php

The eligible meter list consists of the manufacturer name, model number, display type and whether it is PBI eligible.[8] As of May 17, 2017, the meter list consists of 588 models. A portion of the eligible meter list posted in the Go Solar California website is shown in Figure 5.

Figure 5: Portion of Posted Eligible Meters

http://www.gosolarcalifornia.org/equipment/system_perf.php

Manufacturer Name	Model Number	Display Type	PBI Eligible*	Notes
ABB	CDD	LCD	N	For use only with ABB MICRO Series micro-inverters. Up to 32 inverters may be connected to a single CDD.
ABB	PVI-3.0/3.6/3.8/4.2-TL-OUTD	Digital	N	ABB String Inverters. Internal metering
ABB	PVI-5000/6000-TL-OUTD	Digital	N	ABB String Inverters. Internal metering
ABB	UNO-7.6/8.6-TL-OUTD	Digital	N	ABB String Inverters. Internal metering
ABB (Power-One)	RGM-Module-US	Digital	Y	Revenue grade metering in accordance to ANSI C12.20 0.2% accuracy class
ABB/Elster	AB1	Dial or Cyclometer	N	NA
ABB/Elster	ABS	Dial or Cyclometer	N	NA
ABB/Elster	AlphaPlus - A1D+	LCD	Y	NA
ABB/Elster	AlphaPlus - A1K+	LCD	Y	NA
ABB/Elster	AlphaPlus - A1R+	LCD	Y	NA
ABB/Elster	AlphaPlus - A1T+	LCD	Y	NA
ABB/Elster	AlphaPlus - A1TL+	LCD	Y	NA
Accuenergy	Acuvim II	LCD	Y	Intelligent power meter with multiple communication and IO capabilities.
Accuenergy	Acuvim IIE	LCD	Y	Intelligent power meter with onboard memory waveform multiple communication and IO capabilities.
Accuenergy	Acuvim IIR	LCD	Y	Multifunction power meter with onboard data logging.

Source: Example from List of Eligible Meters located at: http://www.gosolarcalifornia.org/equipment/system_perf.php

8 Meets Performance Based Incentive program eligibility with certificate documenting accuracy to less than 2 percent.

The eligible OSEGT list consists of the manufacturer name, model name and technology description. As of May 17, 2017, the OSEGT list consists of 242 models. A portion of the OSEGT list posted in the Go Solar California website is shown in Figure 6.

Figure 6: Portion of Posted Eligible OSEGT

Manufacturer	Model	Technology	Notes
AU Optronics Corporation	PM240PA0_235	225W ACPV	NA
AU Optronics Corporation	PM240PA0_240	225W ACPV	NA
AU Optronics Corporation	PM240PA0_245	225W ACPV	NA
AU Optronics Corporation	PM240PA0_250	225W ACPV	NA
AU Optronics Corporation	PM250MA0_245	225W ACPV	NA
AU Optronics Corporation	PM250MA0_250	225W ACPV	NA
AU Optronics Corporation	PM250MA0_255	225W ACPV	NA
AU Optronics Corporation	PM250MA0_260	225W ACPV	NA
AU Optronics Corporation	PM250MA0_265	225W ACPV	NA
AU Optronics	PM240PA0_250	225W ACPV	NA
AU Optronics	PM250MA0_265	225W ACPV	NA
Amonix	7000 Mega Module	High Concentration PV Module	NA
Amonix	7000 Mega Module	High Concentration PV Module	NA
Atlantis Energy	ATL 120/125W	PV Skylight	NA
Atlantis Energy	ATL 120/125W	Photovoltaic Skylight	NA
Cogenra Solar	200-0992	460W SunDeck PVT 2.0, concentrating solar photovoltaic + thermal technology	NA
Cogenra Solar	200-0992	460W SunDeck PVT 2.0, concentrating solar photovoltaic + thermal technology	NA

Source: Example from List of Eligible OSEGT located at: http://www.gosolarcalifornia.org/equipment/other.php

The eligible PMRS provider list consists of the provider and its website. The list was last updated on May 17, 2017, and consists of 163 PMRS providers. A portion of the eligible PMRS provider list posted in the Go Solar California website is shown in Figure 7.

Figure 7: Portion of Posted Eligible PMRS Providers

Company	Website
A1 Sun, Inc.	www.a1suninc.com
A24 Solar Corp	www.A24solar.com
ACA Technology Inc / ACA Solar	www.acasolar.com
Accurate Comfort Systems, Inc.	www.actionac.net
All - Pro Electrical Services	APElectricalSves@aol.com
Ally Electric and Solar	www.allyelectricandsolar.com
Also Energy LLC	www.alsoenergy.com
Alternative Energy, Inc.	www.alternativeenergyinc.com
Ambassador Energy, Inc.	www.ambassadorenergy.com
Ameko Power Solar Corp.	www.amekogroup.com
American Solar Direct	www.americansolardirect.com
Apex Solar, Inc.	www.apexsolarinc.com
Apparent Inc.	www.apparent.com
Applied Power Technologies (APT)	www.apt4power.com
Around Town Electric	www.aroundtownelectric.net/
Atlas Solar, Inc.	www.atlas-systems.net
Avatar Solar Inc.	www.manta.com/c/mtbz075/avatar-solar
Bella Solar	www.bellasolar.com
Blue Cat Studio, Inc.	www.cobramonitoring.com www.bcsienergytracking.com

Source: Example from List of Eligible PMRS located at: http://www.gosolarcalifornia.org/equipment/perf_monitor.php

Scope of Work and Schedule

The technical portion of AESC's scope of work was separated into three tasks: equipment review, new technology review, and technical policy support. These three tasks are described below.

Equipment Review

This task sought to provide ongoing support for maintaining the Energy Commission's lists of eligible solar equipment. To be added onto the lists, equipment must meet the eligibility criteria as defined in the SB 1 Guidelines. Only systems using equipment on the Energy Commission's lists may receive incentives from California's solar electric incentive programs (including the NSHP, CSI, and POU programs).

AESC was responsible for:

- Responding to inquiries from industry representatives related to the current lists of eligible equipment, including requests to add new equipment or update equipment that is already on the lists.
- Reviewing submissions from industry representatives requesting to add new equipment or update equipment that is already on the lists. Determine whether submissions are complete and comply with SB 1 eligibility requirements as identified in the current version of the SB 1 Guidelines.
- Modifying equipment review processes according to any updates to the SB 1 eligibility requirements to the lists of eligible equipment.
- Obtaining additional information from industry representatives regarding requests to add new equipment to the lists of eligible equipment.
- Responding to technical inquiries about the equipment requirements from the public and from Energy Commission staff on a case-by-case basis.
- Working with the Energy Commission agreement manager (CAM) to resolve any case-specific concerns with eligibility requirements.
- Submitting updated eligible equipment lists (using Energy Commission-supplied templates) for solar PV modules, inverters, system performance meters, OSEGT, and PMRS providers to the CAM by the 25th day of each month and as needed, upon request. Submitting electronic file (compressed .zip file) to the CAM that contains documents submitted by industry representatives for all equipment added to lists (on a case-by-case basis, upon request by the CAM).

Deliverables, or goods and services produced from a project, include:

- Revised eligible equipment lists for solar PV modules, inverters, system performance meters, OSEGT, and PMRS providers.
- Electronic file (compressed zip file) containing documents submitted by industry representatives for all equipment added to lists (on a case-by-case basis, upon request by the CAM).

Review of New Technology Requests

This task conducted technical evaluations and provide recommendations to Energy Commission staff regarding the feasibility of including new technologies on the eligible equipment lists. Work under this task was necessary only upon request by the CAM.

AESC was responsible for:

- Reviewing industry representatives' requests to add products to the eligible equipment list that are not standard nonconcentrating photovoltaic modules, system performance meters, inverters, or PMRS providers.
- Determining if the information presented by the industry representative addresses all items necessary to meet the current requirements in the SB 1 Guidelines for OSEGT.
- Advising the CAM on whether a detailed evaluation is necessary (only if the equipment complies with the requirements in the SB 1 Guidelines).
- Evaluating the technical merits of the request, working with the requesting party to obtain any missing information, and submitting an electronic summary of the research results and recommendations to the CAM.

Deliverables included:

- A summary of research results and recommendations for new technology requests.

Technical Support for Policy Considerations

This task provided recommendations on the technical eligibility criteria requirements of the *Guidelines for Solar Electric Incentive Programs (Senate Bill 1)* to reflect changes in technology and market outlook. Work under this task is necessary only upon request by the CAM.

AESC was responsible for:

- Reviewing draft language and/or propose changes to be included in the SB 1 Guidelines.
- Reviewing current lists of eligible equipment and providing recommendations for removing equipment from the lists (as necessary and upon request by the CAM).

Deliverables included:

- A summary of recommendations or proposed draft language to be included in the SB 1 Guidelines.
- A summary of recommendations for removing equipment from the lists of eligible equipment.

Transitional Technical Training

This task was provided Energy Commission staff with the necessary training on the technical review and other processes employed by AESC to transition the current responsibilities to the Energy Commission. The training consisted of oral and written explanation of each step of the processes used to organize, evaluate, and respond to equipment listing requests from manufacturers.

Deliverables included:

- Eligible equipment listing instructions used by AESC.
- Examples of written communications with manufacturers, templates, and forms used by AESC.

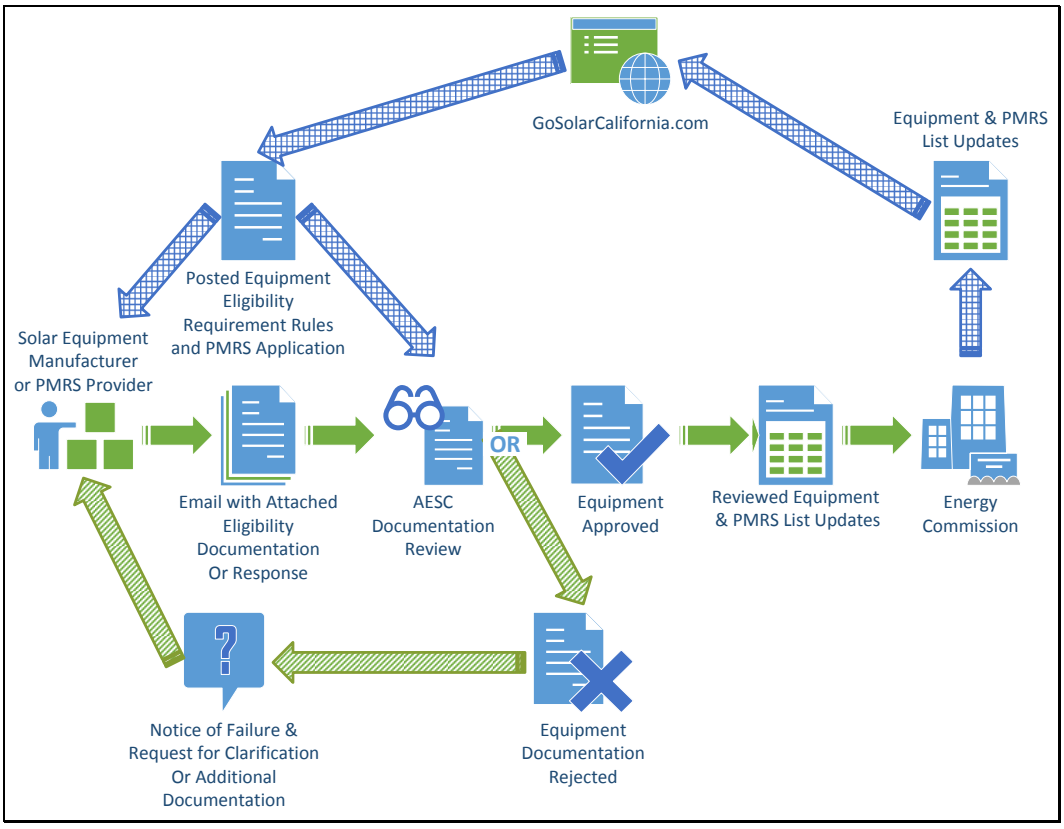
CHAPTER 2:
Equipment Review

Description

The solar equipment technical review provided ongoing support for maintaining the Energy Commission's list of eligible solar equipment. In order to be added onto the lists, equipment must meet the eligibility criteria as defined in the SB 1 Guidelines. Only systems using equipment on the Energy Commission's list may receive incentives from California's solar electric incentive programs.

The Energy Commission posts the updated lists of eligible equipment to the Go Solar California website monthly for use by manufacturers, retailers, and customers. The overall review process is illustrated in Figure 8.

Figure 8: Solar Equipment Review Process

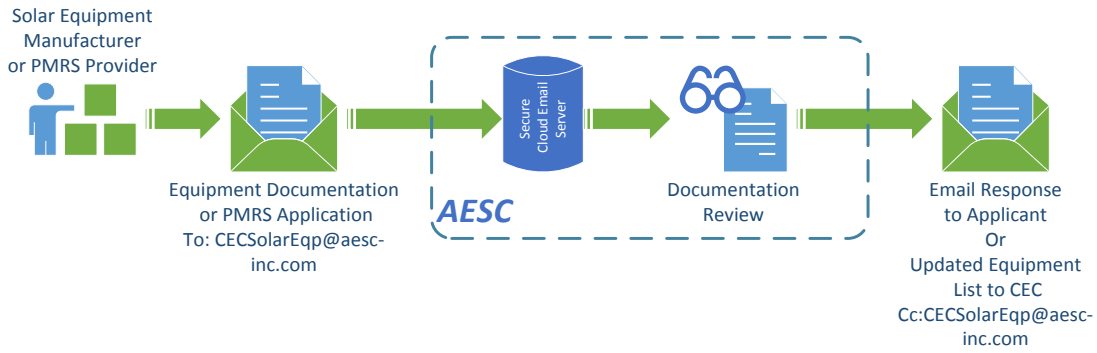


Source: Alternative Energy Solutions Systems Consulting, Inc. & California Energy Commission

AESC developed an internal process to efficiently, track, and review submitted application documentation. All equipment documentation was processed within the same framework. The internal process is described below.

1. Solar equipment manufacturers (inverters, meters, PV modules and OSEGT), as well as PMRS providers, submit their documentation packages by emailing CECSolarEqp@aesc-inc.com. The CECSolarEqp@aesc-inc.com emails are collected in a secure cloud-based inbox that is accessible only by authorized AESC personnel, as illustrated in Figure 9.

Figure 9: Solar Equipment Emails Collected in Cloud Based Inbox



Source: Alternative Energy Solutions Systems Consulting, Inc.

2. At the start of each new submittal review period (typically after the 15th of each month), new electronic folders are created for each equipment type, (inverters, meter, PV modules, OSEGT and PMRS).
3. AESC personnel routinely check the CECSolarEqp@aesc-inc.com inbox for new email submittals, responses, and inquiries.
4. When emailed documentation is received, the attached submittals are copied into the applicable electronic folder.
5. After the submittals are transferred into the electronic folder, the submittals are reviewed.
6. The submittals are reviewed using the appropriate equipment checklist.
7. If during the review it was discovered that required documentation was missing or some of the documentation required follow-up information, an email, with Cc to CECSolarEqp@aesc-inc.com, is sent to the originator of the submittal.
8. In addition to performing step 2, some of the daily emails are responses to emails sent in step 6. In cases where a response is received, complete steps 3-6.
9. As part of the equipment review, data are entered into SB 1 update Excel workbook.
10. When all PV submittals have been entered into the SB 1 update Excel workbook for the current month, the information from the data workbook is copied into the Excel workbook labeled Equipment List Tools and Formulas update.
11. The Equipment List Tools and Formulas update Excel workbook is then reviewed to verify that the submitted data are complete.
12. The appropriate equipment list Excel workbook is then updated using the SB 1 update Excel workbook.

13. All three Excel workbooks are updated and, once completed, are emailed to the Energy Commission by the 25th of each month, along with the submittals from each manufacturer.

The steps for each equipment review are detailed in the following subsections.

PV Module Review

For PV modules, equipment manufacturers are required to submit the following documents for eligibility review.

- PV module application form workbook
- Proof of meeting UL1703
    - UL1703 certification has to explicitly list all module names. If module names are missing, the reviewer must reject the application, with no exceptions allowed.
    - Must come from an NRTL with the UL1703 standard in its scope.
    - Certificates can be checked by accessing online databases as well.
- Performance test report from an NRTL
    - Based on IEC Standard 61215 (crystalline modules) or IEC 61646 (thin films) plus two additional temperature coefficients.
    - Required tests:
        - Performance at STC (1,000 W/m², 25°C module temp)
        - Performance at NOCT (800 W/m², module at NOCT temp):
            - NOCT and temperature coefficients have to be tested on a module with rated power within 5 percent of the highest submitted module.
            - NOCT & temperature coefficients should be tested on the same module and by the same lab (can't mix NOCT from one test report and temperature coefficients from another).
            - NOCT: low end around 43°C; anything below this, and the lab is asked to investigate. Products with NOCT below 43°C are not eligible.
        - Performance at low irradiance (200 W/m², 25°C module temp).
        - Determination of NOCT.
        - Determination of temperature coefficients.
            - All five temperature coefficients are required, whereas IEC only requires three coefficients.
            - Temperature coefficients and electrical parameters are tested together by lab in order to get units of %/°C as a percentage change of P_{MAX}, I_{PMAX}, V_{PMAX}, I_{SC}, V_{OC}

- If the test report has coefficients reported in W/°C, then units of %/°C by using the electrical parameters can be calculated, but this is not preferred. Formula:

$$\frac{W}{°C} \times \frac{100\%}{Max\ Power\ (W)} = \frac{\%}{°C}$$

- Power temperature coefficient low end of -0.43 %/°C for crystalline products. Data with values less negative than -0.43 must be substantiated by a second test, primarily because low values are a possible indication of laboratory test errors.
    - Some exceptions with power temperature coefficients known to be low:
        - Most thin films (particularly a-Si). For these products, compare the value to modules of the same technology already on the list. It can be accepted if it is in the same range (within 10 percent).
        - SunPower back contact cells.
        - Sanyo HIT hybrid cells.
        - Suntech Pluto cells.

- Additional testing for thin film photovoltaics
    - Electrical parameters must be tested after light soaking (Section 10.18 of IEC 61646).
    - Thin film modules degrade during the first six months of use, so the test gets the performance close to field performance.
    - Light soaking done by the manufacturer is acceptable, subject to the confidence level of the testing lab performing the light soaking process correctly and completely.
- ILAC[9] laboratory testing required
    - See Go Solar California website and guidelines for a (nonexhaustive) list of approved labs.[10]
    - To check the accreditation of a lab that is not already on this list:

9 The International Laboratory Accreditation Cooperation (ILAC) is the international organization for accreditation bodies operating in accordance with ISO/IEC 17011 and involved in the accreditation of conformity assessment bodies, including calibration laboratories (using ISO/IEC 17025), testing laboratories (using ISO/IEC 17025), medical testing laboratories (using ISO 15189), and inspection bodies (using ISO/IEC 17020).

10 http://www.gosolarcalifornia.ca.gov/equipment/documents/PV_Eligibility_Procedure.pdf.

- Find the National Certifying Body (NCB). Generally, this is on the lab's certificate of accreditation. The reviewer will likely have to ask the lab for this.
- Make sure that the NCB has signed the ILAC MRA (http://www.ilac.org/documents/mra_signatories.pdf).
- Search for the accredited testing laboratory on the NCB's website.
- Once the lab is identified, check the scope for IEC 61215 and/or 61646.

- Accuracy of Test Data
  - Tested maximum power (P_{MAX}) has to be within 5 percent of the rated value, unless the tested power is higher than the rated P_{MAX}. If a tested value is within 5% + lab accuracy %, is generally acceptable.
  - The rest of the tested values (voltage and current) have to be within 10 percent of the rated values.

Module grouping is permitted if the submitted test data can be applied to a family of modules with rated (not tested) power within 5 percent of the tested module. For example, test data from a 200 W module can be applied to 190 W to 210 W modules. A *module family* is defined as a group where modules are identical in all ways except rated power. Large families of modules will need multiple modules tested. For more information on module grouping, see the SB 1 Guidelines. Additional testing is needed for modules with different:

- Cell size, type, or manufacturer.
- Encapsulation material thickness.
- Cover glass reflective properties (type of glass coating—none to antireflective).
- Number of bus bars.
- Back sheet color.
  - If different back sheet colors with a single model number, then manufacturers must test the black back sheet (presumed to have the highest NOCT).
  - If different back sheet colors have different model numbers, then manufacturers can choose between:
    - Testing each back sheet color separately and applying data to applicable model number(s).
    - Testing black back sheet only and applying to all model numbers.

Additional testing is not required for modules with different:

- Junction boxes.
- Frame color or shape.

- Cable lengths.
- Generally, if a modification affects the performance of a module then the manufacturer needs to retest effected module.
- The Energy Commission rates all PV modules using the PTC rating standard.
- Module area.
- Power temperature coefficient (how the power output of the module is related to temperature).
- Nominal operating cell temperature (NOCT):
    - The temperature of cells at 800W/m² irradiance, 20°C air temperature, and wind speed at 1 m/s.

When manufacturers wish to rebrand their modules, they must provide:

- A multiple listing letter showing how model numbers correspond for the two brand names. Pull data from the master spreadsheet, copy and paste to the update and modify the brand name and model number(s). If the original module is already on the list, a multiple listing (ML) letter issued by an NRTL is required.
- If the original model is not on the list, the application process is the same as if it was not an ML.

Modules that have integrated microinverters on each panel have two options available for making the eligibility list: the PV module list if they are only going to apply for lump-sum incentives or the OSEGT list if they are going to apply for performance-based incentives (PBI). If only PBI is desired, the following is required:

- The ACPV assembly has UL 1741.
- The UL 1741 constructional data report or similar shows the method of attachment of the micro-inverter to the module.

For ACPV to qualify for lump-sum (EPBB) incentives, the following is required:

- The corresponding DCPV module is included in the eligible PV modules.
- The corresponding microinverter is included in the eligible inverters.
- The ACPV assembly has UL 1741.
- The UL 1741 constructional data report or similar shows the method of attachment of the microinverter to the module.

Inverter Review

Inverter equipment manufacturers are required to submit the following for eligibility review:

- Inverter application form workbook.
- Proof of UL 1741 by an NRTL.
- Manufacturer gets the product tested for performance data in accordance with "Performance Test Protocol for Evaluating Inverters Used in Grid-Connected PV Systems":

        - Maximum continuous output power.
        - Conversion efficiency.
        - Tare losses[11].
    - Manufacturer fills out the weighted inverter efficiency form.
    - Refer to "Inverter Evaluation Procedures" handout for additional instructions on how to review inverter applications.

In addition, the manufacturer must submit the inverter weighted efficiency form meeting the following:

- Proof that the equipment used for testing must be in calibration when the test is performed.
- Efficiency curves:
    - If the curve is not smooth, run standard deviation analysis among data points.
    - High standard deviation indicates data are not consistent and there may be a measurement error.
    - Check that the average of the weighted efficiencies equals the Energy Commission efficiency.
- A minimum of five measurement sets are required.
- The maximum continuous output power is the lowest recorded value in the max power data set.
- Documentation confirming that the proper transformer efficiency values were used. Example documentation shown below in Figure 10.

11 In a photovoltaic system a tare loss is: 'A, loss caused by the controller. One minus tare loss, expressed as a percentage, is equal to the controller efficiency'.

Figure 10: Example Inverter Test Results

Manufacturer: Power Electronics

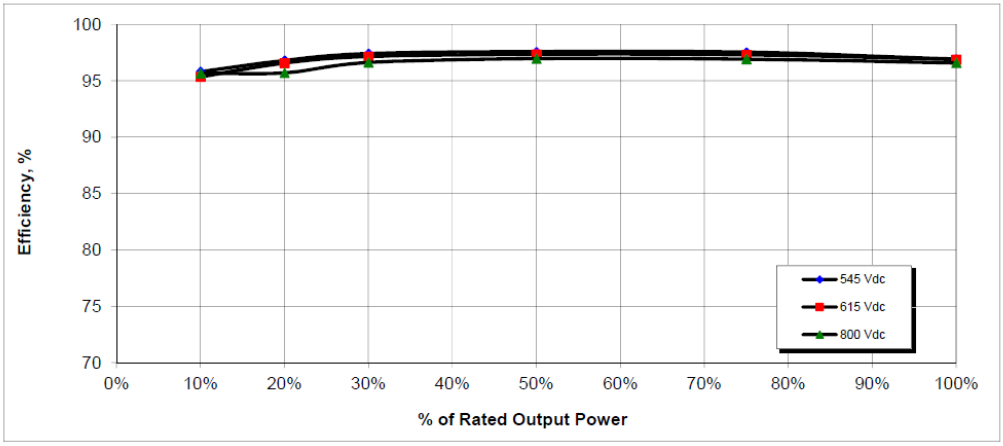
Model #: FS1050CU, FS1050PU

Rated Maximum Continuous Output Power: 1050.00 kW Night Tare Loss: 356 W

Vmin: 545 Vdc Vnom: 615 Vdc Vmax: 800 Vdc

		Power Level (%; kW)						
		10%	20%	30%	50%	75%	100%	
Input Voltage (Vdc)		105.00	210.00	315.00	525.00	787.50	1050.00	Wtd
Vmin	545	95.81	96.80	97.40	97.57	97.52	96.91	97.38
Vnom	615	95.34	96.56	97.15	97.34	97.30	96.87	97.15
Vmax	800	95.65	95.69	96.60	96.95	96.90	96.57	96.75

CEC Efficiency of Inverter and MV TP1 Transformer = 97.0%



Source: Example from http://www.gosolarcalifornia.org/equipment/inverter_tests/summaries/n

Meter Equipment Review

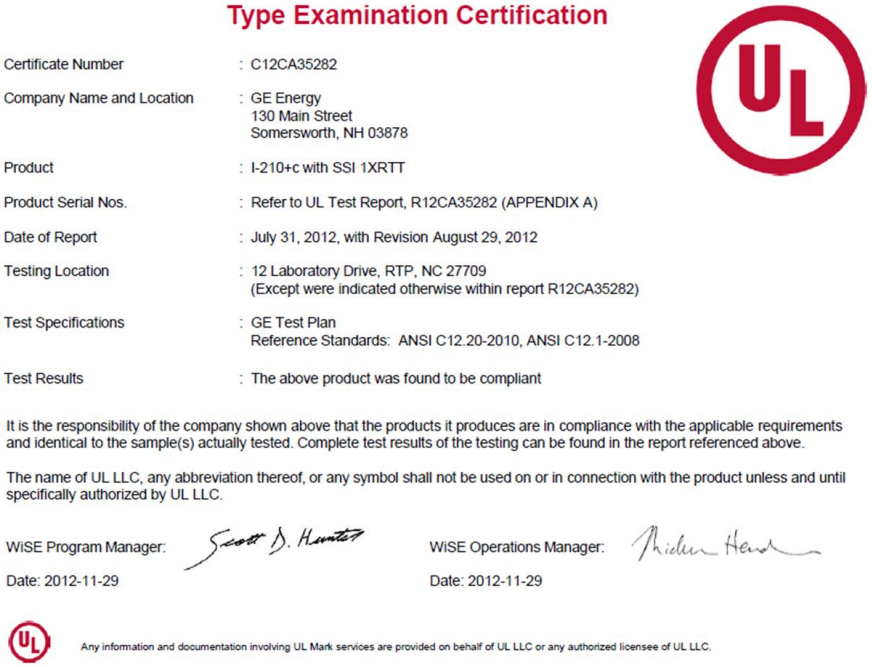
Eligible electric meter manufacturers must submit the following for review:

- For revenue grade meters:
  - Meter must be certified to ANSI C12.1 or ANSI C12.20 and pass **all** applicable tests. Only submitting accuracy testing is not sufficient.
  - Testing must be completed by an NRTL.[12]
- For nonrevenue meters, just an application form needs to be submitted. Nonrevenue grade meters are "self-certified" that the accuracy is within +/- 5 percent or better.

An example ANSI C12 Certification is shown in Figure 11.

12 http://www.osha.gov/dts/otpca/nrtl/.

Figure 11: Example ANSI C12 Certification



Type Examination Certification

Certificate Number	:	C12CA35282
Company Name and Location	:	GE Energy 130 Main Street Somersworth, NH 03878
Product	:	I-210+c with SSI 1XRTT
Product Serial Nos.	:	Refer to UL Test Report, R12CA35282 (APPENDIX A)
Date of Report	:	July 31, 2012, with Revision August 29, 2012
Testing Location	:	12 Laboratory Drive, RTP, NC 27709 (Except were indicated otherwise within report R12CA35282)
Test Specifications	:	GE Test Plan Reference Standards: ANSI C12.20-2010, ANSI C12.1-2008
Test Results	:	The above product was found to be compliant

It is the responsibility of the company shown above that the products it produces are in compliance with the applicable requirements and identical to the sample(s) actually tested. Complete test results of the testing can be found in the report referenced above.

The name of UL LLC, any abbreviation thereof, or any symbol shall not be used on or in connection with the product unless and until specifically authorized by UL LLC.

WiSE Program Manager: Scott D. Hunter Date: 2012-11-29

WiSE Operations Manager: Date: 2012-11-29

Any information and documentation involving UL Mark services are provided on behalf of UL LLC or any authorized licensee of UL LLC.

OSEGT Review

"Other solar electric generating technologies" are all technologies other than flat-plate, nonconcentrating modules that use solar energy to generate electricity. To be considered for eligibility, the OSEGT must provide proof that they are certified to all applicable safety standards by an NRTL. The NRTL must go through the necessary evaluation to authorize applying their “mark” to the product. Required testing protocol is going to vary significantly depending on the type of the product. Performance testing is not required.

PMRS Review

Under the California Solar Initiative program, which covers all existing homes and all existing and new nonresidential buildings, the solar PV system owner must contract with a Performance Monitoring Reporting Service (PMRS) provider to monitor and report on the minimum data points and all monitoring, data collection, data retention. PMRS reporting must be performed as specified in Subsections 5.5.1 and 5.5.2 of the CSI handbook. Applicants must use the Energy Commission’s list of qualifying PMRS providers. To be considered for eligibility on the Energy Commission’s list of qualifying PMRS providers, PMRS providers must complete and submit the application form found on the Go Solar California website. Testing or certifications are not necessary.

Eligible performance data providers (PDPs) are not managed by the Energy Commission and are not part of the screening processes described in this report.

CHAPTER 3:
Results

Program Statistics

On a monthly basis AESC submitted Energy Commission solar equipment progress reports that included the number of submittals received, approved, and not approved, with reasons for nonapproval for each equipment type. Table 1 summarizes the review result statistics.

Table 1: Solar Equipment Eligibility Review Statistics

Equipment	Number of Requests	Approved	Not Approved[13]	Approval %
Inverters	804	758	46	94%
Meters	153	151	2	99%
PMRS	25	23	2	92%
PV Modules	11903	10215	1688	86%
OSEGT	6	3	3	50%

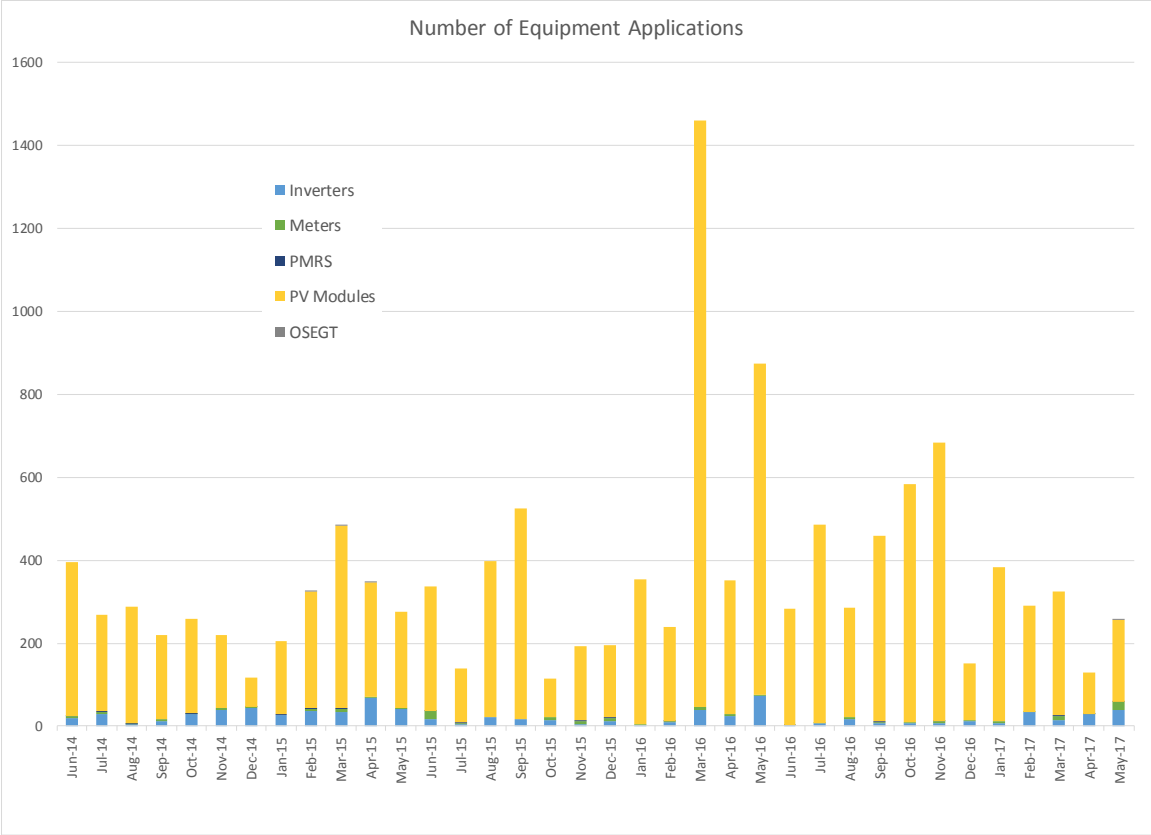
Source: Alternative Energy Systems Consulting, Inc.

From June 2014 through May 2017, AESC reviewed 12,891 equipment eligibility applications. About 11,150 were approved, an 86 percent approval rating. Some of the equipment that was not approved was approved in subsequent resubmissions.

13 The vast majority of rejected applications were later approved upon resubmission of corrected documentation.

Figure 12 below, shows the number of equipment applications received and processed by month. In general, the number of equipment applications has been increasing and has been dominated by PV module applications. The number of applications peaked in March 2016 with more than 1,400 processed applications.

Figure 12: Number of Equipment Applications



Source: Alternative Energy Systems Consulting, Inc.

Common Cause of Failures or Resubmissions

Each month AESC submitted the reasons for every type of equipment that was not approved to be added to the Energy Commission equipment list. Descriptions and statistics for various eligibility issues are described in each subsection below.

PV Modules

Table 2 summarizes the major issues with PV module eligibility documentation.

Table 2: PV Module Eligibility Issues

Issues Leading to Rejection	Number of Applications	Failure %
Temperature Coefficient	266	15.9%
Authorization to Mark	212	12.6%
Multiple Listing	80	4.8%
PTC Rating	7	0.4%
Nameplate Out of Tolerance with Test Report	629	38.9%
NOCT	23	1.4%
Test Report	427	25.5%
Legal Issues	7	0.4%
Duplicate Applications	16	1.0%
Materials of Construction	10	0.6%

Source: Alternative Energy Systems Consulting, Inc.

Each issue is explained in detail below;

- ***Temperature Coefficient***
  There are five temperature coefficients required to be tested and reported. Some test reports were submitted with a maximum power temperature coefficient that was less negative than -0.43 percent/C. In these cases, the testing lab was required to support the results with a retest. Also, some test reports were submitted with only three temperature coefficients instead of the required five.
- ***Authorization to Mark***
  This issue relates to the UL 1703 Authorization to Mark letter from the NRTL that permits manufacturers to mark their product as certified to meet UL 1703. Some of the issues included PV module not being listed on the authorization to mark for that manufacturer or the letter never being submitted or submitted sometime later.
- ***Multiple Listing***
  "Multiple listing" is where the same equipment is listed under different suppliers and

occasionally different model identifier – making the equipment listed multiple times for retail marketing purposes. Some of the issues observed include the following:

  - Occasionally, the requested rebranded modules (ML) do not have the base module listed.
  - On a few occasions, a manufacturer has PV modules ML listed using manufacturer as the base model and then requests to relist the same PV module model number with a different manufacturer.

- ***PTC Rating***
  Some submittals requested to update the PTC rating based on a recent test report. If the existing PTC rating was higher than the PTC rating from the recent test report, manufacturers would be asked to confirm whether they want to update the PTC rating with the lower value. Manufacturers rarely agree to this, which in turn means the existing data would remain unchanged.
- ***Nameplate Out of Tolerance With Test Report (NOCT)***
  The submitted test report nameplate rating must be within 5 percent of the PV modules nameplate power rating. If the module nameplate power rating to test result difference was more than +/- 5 percent, the requested PV module could not be added. This is the most common reason for not adding a requested PV module.
- ***NOCT***
  Some manufacturers submit test results based on an NOCT temperature that exceeds the allowable limit of 43°C, which makes the request ineligible.
- ***Test Report***
  Some applications do not include a copy of the actual test report, which is required.
- ***Legal***
  Few applications submitted did not meet the legal requirements set forth by the Energy Commission.
- ***Duplicate Applications***
  Occasionally a submittal is a duplicate application from a previous month submitted again prior to the website being updated.
- ***Materials of Construction***
  A white back sheet test report cannot be used to add a black back sheet PV module. The NOCT of the black back sheet is typically higher and therefore not able to perform as well as a white back sheet PV module.

Inverters

Table 3 summarizes the major issues with inverter eligibility documentation.

Table 3: Inverter Eligibility Issues

Issues Leading to Rejection	Number of Applications	Failure %
NRTL Documentation	1	2.2%
Excel Spreadsheet	8	17.4%
Authorization to Mark	2	4.3%
No DC Module	2	4.3%
Duplicate Applications	6	13.0%
3-Hour MCOP	8	17.4%
Calibration Test Equipment	1	2.2%
Mfg. Requested Suspension	3	6.5%
Test Report	5	10.9%
Corrections After Deadline	10	21.7%

Source: Alternative Energy Systems Consulting, Inc.

The breakdown shows the specific reason for nonapproval. All the nonapprovals were later approved (usually the following month) except for the six duplicate nonapprovals that were already on the list. Sometimes manufacturers submit multiple requests to add identical equipment.

- ***NRTL Documentation***
  Submitted a test report from a nonapproved NRTL.
- ***Excel Spreadsheet***
  Summary spreadsheet file was not included.
- ***Authorization to Mark (ATM)***
  This issue relates to the UL 1703 Authorization to Mark letter from the NRTL that permits manufacturers to mark their product as certified to meet UL 1703.
- ***No DC Module***
  AC ACPV request was submitted, but the DC module had not yet been approved.
- ***Duplicate Applications***
  Occasionally a submittal is a duplicate application from a previous month submitted again prior to the website being updated.

- ***3-Hour MCOP***
  Data are missing or results are not presented correctly for maximum continuous operating power tests.
- ***Calibration Test Equipment***
  The test equipment date used to certify the inverter was after the calibration due date.
- ***Manufacturer Requested Suspension***
  Manufacturer was asked to delay publishing the equipment until a few months later.
- ***Test Report***
  The test report was not signed. Requested clarifications were needed but not received until after the monthly update.
- ***Corrections After Deadline***
  Application corrections were received after the due date.

Meters

On two occasions meters were not added. Those meters were PBI meters that either did not submit the ANCI C12 Certificate or the certificate was a test report in a language other than English; however, both submittals were eventually approved.

PMRS

There were two occasions where PMRS applications were not added, and they both were due to the website not being active. They were both added later when the website was active.

OSEGT

One submittal requested three modules to be added; however, only one module was added due to issues with the ATM not listing each specific model. Recently, AESC received a request to change the manufacturer name but did not receive a response before the end of the contract. The Energy Commission has been informed and will handle this issue.

Transition Training

To simplify handing the review process to the Energy Commission, weekly training sessions were conducted. These trainings were conducted remotely from February 2017 to June 2017, using WEBEX format and followed an agenda put together by Energy Commission staff before each weekly session. Below are some examples of topics that were discussed:

- Information and data management (email, phone, file management, and so forth).
- Duties currently performed by AESC (walkthrough and process a few applications).
  - Reviewing equipment applications
  - PV modules
  - Inverters
  - Performance meters
  - OSEGT
- Communication from/to manufacturers.

- Scope of training and timeline to transition technical and institutional knowledge from AESC to Energy Commission staff.
- Opportunities to improve current SB 1 equipment listing processes.
- Outreach plan to manufacturers (public notice, email blast, and so forth).
- Overview of NEW proposed process to be performed by Energy Commission:
    - General discussion: listing mark verification vs. authorization to mark
    - Processing PV modules
        - Review of new PV module form for beta testing
        - Discuss subgroups inclusion and processing
    - Processing inverters (including smart inverters)
        - Test report requirements
        - Request that AESC review new form
    - Processing performance meters
        - Request that AESC review new form
    - Processing OSEGT
        - Request that AESC review new form
- Overview of lab reports.
- Transition schedule was also addressed:
    - Energy Commission in-house start (Go-Live) May 16, Tuesday
    - AESC last day receive requests May 15, Tuesday
    - AESC deadline to accept info May 23, Tuesday
    - AESC last processing date May 26, Friday
- Webinar schedule – June 13 and June 20.

In addition to items covered in the weekly agenda, the Energy Commission also listed action items that needed to be completed either before or by the following meeting or had a specific due date. Most of these items pertained to transition planning and implementation, but other items were unrelated to the transition phase, such as planning and setting due date for AESC's final report.

CHAPTER 4: Conclusions

Lessons Learned

Several observations were made by AESC over the program period. The primary observations are listed below.

- The eligibility review process is well tolerated by solar equipment manufacturers. They appear willing, if not eager, to have their equipment vetted by a third party and posted publicly.
- The 15 percent rejection rate for initial submissions is reduced to nearly zero for subsequent revised submissions.
- The review process could be further streamlined.
- There are challenges with the management of eligible equipment obsolescence, the tracking of base equipment for multiple listings, and the search of a large PV module list.
- Equipment manufacturers are not always consistent with their submittal documentation resulting in delays and additional review time.
- Available processing time is limited when there is a surge of submittals.
- Some parameter checks are not publicly documented (for example, power temperature coefficient limits) or have not been updated to align with technology changes.
- There are many users of the posted solar equipment eligible lists, including the California IOU Self-Generation Incentive Program (SGIP) and POUs' solar incentive programs. Some are outside California, and a few are international. The type of use can range from simply confirming an eligible equipment make and model to integrating the equipment lists and related performance parameters into production calculators, sales systems, or field engineering tools.

Recommendations

The following recommendations are provided with the understanding that the long-term need for the solar equipment eligible lists is not certain. Regardless, if there is a long-term future, these recommendations can reduce costs, increase accessibility and manageability, and increase the utility and value of the equipment lists.

- Develop Web-based electronic forms for time-efficient entry of data by the manufacturers. The forms should include checks for data integrity and eligibility limits. The data would be automatically entered into a database and, following successful and thorough eligibility review, released directly into the public eligible list.
- Consider making the lists and equipment performance parameters available via a Web service or simple API to promote the use of the lists by external automated systems.

- Survey manufacturers and users to determine the value of the eligible equipment lists, better understand the value of the lists, and gather suggestions for improvements.
- Add data fields to the master list to track entry date, add revision date(s), and identify base equipment for multiple listings.
- Provide a blog or comment posting from the Energy Commission to notify manufacturers and the public when an update has occurred.
- Develop a routine process for removing discontinued equipment, with safeguards to ensure that the market would not be disrupted by the removal.
- Make the eligible equipment list available within an online searchable database.
- Revisit and add to the public eligibility documentation parameter checks such as the power temperature coefficient limits to ensure they are applicable and the market is informed.
- Consider moving the equipment documentation submission due date to the beginning of the month for updates in the following month. This will allow additional time to dialogue with the manufacturers to correct their submissions in time for the next update.

Energy Commission's New Equipment Request Form Feedback

AESC assisted the Energy Commission in developing the new equipment request forms and provided feedback as an email or a separate Microsoft Word document summarizing the recommendations. The feedback was both for the development of the new form and suggestions for the review of the submittals. Here is an example of some of the feedback for PV module requests:

The flow of submittals should follow what was done in the old process.

The goal was to put all the manual entry on the manufacturer, and AESC believes that the new PV equipment request form does that. AESC advises Energy Commission staff to consider the following when reviewing requests:

- Verify that the Laboratory Tested Model (LTM) data were entered correctly from the submitted test report.
- Verify that the LTM meets the applicable SB 1 requirements.
- Verify the PV manufacturer name is consistent.
- Verify there are no marketing terms used in description.
- Verify the UL 1703 Authorization To Mark contains the submitted PV modules requested.
- Verify the test report is from a Nationally Recognized Test Lab or International Laboratory Accreditation Cooperation (ILAC).
- Verify the submittal was from the manufacturer.

- Verify the manufacturer isn't using a white backsheet test report to add a black back sheet PV module.
- Always insist on a correlation between existing base module(s) and the multiple listed module(s).

ATTACHMENT I:
Published Eligibility Requirements

PV Modules

Flat Plate PV Module Eligibility Listing Procedure Updated 10/31/14

Senate Bill 1 (SB1) defines the solar incentive programs for California, and flat plate PV modules [1] must be listed on the SB1 compliant module list to be eligible for incentives in California. Senate Bill 1 encompasses two state-run programs for investor owned utility (IOU) territories, the California Solar Initiative (CSI) and the New Solar Homes Partnership (NSHP), as well as solar incentive programs administered by publicly owned utilities. CSI is for all market segment, with the exception of new residential construction, in IOU territories. NSHP is for the new residential construction market segment in IOU territories.

The process for adding PV modules to the SB1 list is as follows:

1. Data submitted to the Energy Commission will be made public.
2. The factory measured maximum power of each production module and the lower bound of the manufacturer's stated tolerance range must be no less than 95% of the Maximum Power reported to the Energy Commission.
3. The manufacturer gets their product certified to ANSI/UL 1703 by a NRTL whose OSHA scope includes UL 1703 [2]. CSA, Intertek, TÜV Rheinland PTL, and UL are the NRTLs who can currently perform this certification. Each module power rating shall have a unique model number identified in the ANSI/UL 1703 certification. The "List of Eligible SB1 Guidelines Compliant Photovoltaic Modules" will only include unique model numbers specified in the ANSI/UL 1703 certification.
4. The manufacturer gets additional performance parameter testing completed by an ILAC-affiliated laboratory. Additional information on the required testing, including a table of the required performance parameters, a non-exhaustive list of ILAC affiliated laboratories, and information on grouping modules for testing purposes is found in this document.
5. The manufacturer fills out the Energy Commission equipment application form, found here: http://gosolarcalifornia.org/equipment/documents/EQUIPMENT_REQUEST_PV.XLS
6. The manufacturer emails a copy of the ANSI/UL 1703 certification indicating authorization to apply the NRTL's mark, the ILAC laboratory test report, and the Energy Commission equipment application form to CECSolarEqp@aesc-inc.com. **All documentation must be in English – Alternative Energy Systems Consulting, Inc (AESC) will reject any test reports that are not in English.**
7. The PV module eligibility list is updated monthly on the first of the month. The cut-off date for the monthly update is the 15th day of the preceding month; all documentation must be submitted before this date.
8. Private labeling of PV modules: Some businesses wish to private label PV modules for another manufacturer. Such products will be accepted as eligible should the application form be submitted with a multiple listing letter from the listing agency (the NRTL). The multiple listing process is how the listing agency certifies private-labeled products. The multiple listing letter is evidence of certification of the product to ANSI/UL 1703. If the comparable module from the original equipment manufacturer (OEM) is already eligible, no

[1] For the SB1 Guidelines, "PV" refers to flat-plate non-concentrating photovoltaic modules.

[2] For a list of NRTLs and to view NRTL OSHA scopes, visit http://www.osha.gov/dts/otpca/nrtl/

JAPAN

- Japan Electrical Safety and Environment Technology Laboratories (Tokyo)
- TÜV Rheinland Japan, Ltd. (Yokohama)
- UL Japan, Inc. (Ise-shi, Japan)

KOREA

- Korea Testing Laboratory (Seoul) – **61215** ONLY

SPAIN

- AT4 wireless, S.A.
- CIEMAT – PVlabDER
- Fundacion Cener – CIEMAT – **61215** ONLY

TAIWAN

- Industrial Technology Research Institute
- Telecom Technology Center Communication and Photovoltaic Laboratory
- TÜV Rheinland Taiwan Ltd.

USA

- Florida Solar Energy Center
- Intertek Testing Services NA, Inc. (Lake Forest, CA)
- **DNV GL PVEL, LLC (Berkley, CA) (formerly PV Evolution Labs)**
- Renewable Energy Test Center (RETC) (Fremont, CA)
- TÜV Rheinland PTL, LLC *(formerly known as ASU-PTL)*
- UL Photovoltaic Technology Center of Excellence (San Jose, CA)
- CFV Solar Laboratory (Albuquerque, NM)

Non-exhaustive list of ILAC affiliated laboratories:

CANADA

- Exova Canada Inc.

CHINA

- CCIC-CSA International Certification Co., Ltd. Kunshan Branch
- ETL SEMKO Laboratory of Intertek Testing Services Shanghai Co., Ltd.
- LCIE China Company Limited (Shanghai)
- Metrology & Testing Center of China Electronics Technology Group Corporation No. 18th Research Institute (Tianjin)
- National Center of Supervision & Inspection on Solar Photovoltaic Products Quality (Jiangsu)
- Shenzhen Electronic Product Quality Testing Center
- TÜV Rheinland (Shanghai) Co., Ltd.
- Yangzhou Opto-Electrical Products Testing Center (Jiangsu)

GERMANY

- CETECOM ICT Services GmbH (Saarbrücken)
- Fraunhofer -ISE, Institut für Solare Energiesysteme
- PI Photovoltaik Institut Berlin AG
- SGS Germany GmbH (Kurort Hartha)
- TÜV Rheinland Immissionsschutz und Energiesysteme GmbH
- UL International Germany GmbH
- VDE Testing and Certification Institute

INDIA

- Electronics Test & Development Centre (Bangalore) – **61215** ONLY
- UL India Private Ltd (Bangalore) – **61215** ONLY

ITALY

- European Solar Test Installation
- Eurotest Laboratori SrL
- Laboratorio Albacert, divisione della Soc. Albarubens srl

Table of required performance parameter testing:
Modules must be tested to all values unless otherwise noted. All testing must be completed on one module at one laboratory. Tested values will be on the laboratory test report that is submitted.

Parameter	Symbol	Units	Notes
Maximum Power	P_{max}	Watts	1, 5
Voltage at maximum power	V_{Pmax}	Volts	1, 5
Current at maximum power	I_{Pmax}	Amps	1, 5
Open Circuit Voltage	V_{oc}	Volts	1, 5
Short Circuit Current	I_{sc}	Amps	1, 5
Nominal Operating Cell Temperature	NOCT	°C	3
Temperature Coefficients	β_{Voc}	%/°C	2
	β_{Vpmax}	%/°C	
	α_{Isc}	%/°C	
	α_{Ipmax}	%/°C	
	γ_{Pmax}	%/°C	
Voltage at maximum power and low irradiance	$V_{Pmax,low}$	Volts	4
Current at maximum power and low irradiance	$I_{Pmax,low}$	Amps	4
Open Circuit Voltage at low irradiance	$V_{oc,low}$	Volts	4, 6
Short Circuit Current at low irradiance	$I_{sc,low}$	Amps	4, 6
Voltage at maximum power and NOCT	$V_{Pmax,NOCT}$	Volts	5
Current at maximum power and NOCT	$I_{Pmax,NOCT}$	Amps	5
Open Circuit Voltage at NOCT	$V_{oc,NOCT}$	Volts	5, 6
Short Circuit Current at NOCT	$I_{sc,NOCT}$	Amps	5, 6

Notes:

1) Values shall be measured at Standard Test Conditions after preconditioning according to IEC Standard 61215, Section 5, or after light-soaking according to IEC Standard 61646, Section 10.19. Modules may be light-soaked by the manufacturer prior to submitting the modules to a testing laboratory. The testing laboratory shall verify the module stabilization per IEC Standard 61646, Section 10.19.
2) Values shall be measured and calculated according to IEC Standards 61215 and 61646, Section 10.4.
3) Values shall be measured according to IEC Standards 61215 and 61646, Section 10.5. For BIPV modules the measurements shall be made using the mounting specified below.
4) Values shall be measured at low irradiance according to IEC Standards 61215 and 61646, Section 10.7.
5) Values shall be measured at STC and NOCT according to IEC Standards 61215 and 61646, Section 10.6.
6) The submission of this data is optional.

Grouping of modules for performance parameter testing purposes:
For testing and reporting of performance values by an ILAC accredited laboratory, families of similar modules may be grouped together to reduce the required number of tests. Multiple model numbers may be included in a group, provided that the models are identical except for the STC power rating. Identical applies to all of the following, but is not limited to: all materials, processes (including cell process), cell technology, cell size, encapsulation system, superstrate, backsheet/substrate, cell interconnection materials and techniques, and internal electric circuitry.

For each group, the following tests shall be performed on a model number that has a STC power rating that is within 95 percent (rounded to the nearest Watt) of the highest STC power rating in the group:

1. Nominal Operating Cell Temperature (NOCT) determination
2. Temperature coefficient of short-circuit current
3. Temperature coefficient of open-circuit voltage
4. Temperature coefficient of maximum power current
5. Temperature coefficient of maximum power voltage
6. Temperature coefficient of maximum power

Each group can be further categorized into subgroups where one model number will have further testing performed. All model numbers included in the subgroup shall have the same number of cells. The subgroup may contain model numbers such that the highest STC power rating in the subgroup is 105 percent (rounded to the nearest Watt) of the subgroup's tested model number's STC rating and the lowest STC power rating in the subgroup is 95 percent (rounded to the nearest Watt) of the subgroup's tested model number's STC rating. The tested model number in each subgroup shall be tested for:

Performance at STC:

1. Short-circuit current
2. Open-circuit voltage
3. Current at maximum power
4. Voltage at maximum power
5. Maximum power

Performance at NOCT:

1. Short-circuit current (optional)
2. Open-circuit voltage (optional)
3. Current at maximum power
4. Voltage at maximum power

Performance at low irradiance:

1. Short-circuit current (optional)
2. Open-circuit voltage (optional)
3. Current at maximum power
4. Voltage at maximum power

Example: If a manufacturer has a family of identical modules with STC power ratings of 160 W, 165 W, 170 W, 175 W, 180 W, 185 W, 190 W, 195 W, and 200 W, the following testing is required. For the 190 W module, NOCT determination and temperature coefficient testing shall be performed. The results from these tests are applicable to the entire group of modules. Subgroups can then be created as follows:

185 W, 190 W, 195 W, and 200 W

170 W, 175 W, and 180 W

160 W and 165 W

For the 190 W, 175 W, and 160 W modules, the performance testing at the following conditions shall be performed: STC, NOCT, and low irradiance. The results from these tests are applicable to the modules in the respective subgroup.

re-testing of the performance parameters or submittal of a performance parameter test report is required for the private labeled modules.

Required Performance Parameter Testing:
Attach documentation from laboratory accredited by the International Laboratory Accreditation Cooperation (ILAC) according to the following sections of either the International Electrotechnical Commission Standard 61215, Crystalline Silicon Terrestrial Photovoltaic (PV) Modules - Design Qualification and Type Approval, Edition 2.0, 2005-04, or the International Electrotechnical Commission Standard 61646, Thin-film Terrestrial Photovoltaic (PV) Modules - Design Qualification and Type Approval, Edition 2.0, 2008-05:

Crystalline modules	Thin-film modules
IEC 61215, Edition 2.0, Sections:	IEC 61646, Edition 2.0, Sections:
10.2 Maximum Power Determination	10.2 Maximum Power Determination
10.4 Measurement of Temperature Coefficients[3]	10.4 Measurement of Temperature Coefficients[3]
10.5 Measurement of Nominal Operating Cell Temperature (NOCT)	10.5 Measurement of NOCT
10.6 Performance at Standard Test Conditions (STC) and NOCT	10.6 Performance at STC and NOCT
10.7 Performance at Low Irradiance	10.7 Performance at Low Irradiance
	10.19 Light Soaking

Special Mounting Specifications for NOCT determination for Building Integrated Photovoltaic (BIPV) Modules:
Tilt angle: the test BIPV modules shall be positioned so that they are tilted at 23 degrees ± 5 degrees (5:12 roof pitch) to the horizontal.

Configuration: the test BIPV modules shall be located in the middle of an array that is at least four feet high and four feet wide. The array shall be surrounded on all sides with a minimum of three feet of the building system for which the BIPV system is designed to be compatible, and the entire assembly shall be installed and sealed as specified by the manufacturer for a normal installation.

Substrate and underlayment: the test BIPV modules shall be installed on a substrate of oriented strand board with a minimum thickness of 15/32 inch that is covered by #30 roofing felt with a minimum R-10 continuous insulation under and in contact with the oriented strand board and include any other manufacturer-recommended underlayments.

[3] The performance parameter testing requires the measurement and reporting of five temperature coefficients: temperature coefficient of short-circuit current, temperature coefficient of open-circuit voltage, temperature coefficient of maximum power current, temperature coefficient of maximum power voltage, temperature coefficient of maximum power.

Inverter

Inverter Eligibility Listing Procedure for Solar Electric Incentive Programs Updated 6/2/14

Senate Bill 1 (SB1) defines the solar incentive programs for California, and inverters must be listed on the SB1 compliant inverter list to be eligible for incentives in California. Senate Bill 1 encompasses two state-run programs, the California Solar Initiative and the New Solar Homes Partnership, as well as solar incentive programs administered by publicly owned utilities.

The California Solar Initiative (CSI) is for all market segments with the exception of new residential construction. The New Solar Homes Partnership (NSHP) is for the new residential construction market segment.

The process for adding inverters for California's solar electric incentive programs is as follows:

1. The manufacturer gets their product certified to UL 1741 by a NRTL whose OSHA scope includes UL 1741[1]. CSA, Intertek, MET Laboratories, TÜV Rheinland of North America, TÜV SÜD America, and UL are the NRTLs who can currently perform this testing.

***Private labeling of inverters**: Some businesses wish to private label inverters for another manufacturer. Such products will be accepted as eligible should the application form be submitted with a Multiple Listee letter from the listing agency (the NRTL). The Multiple Listee process is how the listing agency certifies private-labeled products. The Multiple Listee letter is evidence of certification of the product to UL 1741.*

2. The manufacturer gets their product tested for performance data (Maximum Continuous Output Power, Conversion Efficiency, and Tare Losses) and weighted inverter efficiency in accordance with "Performance Test Protocol for Evaluating Inverters Used in Grid-Connected Photovoltaic Systems" by a NRTL that can perform UL 1741 as listed above.[2][3]

3. If not already completed, the manufacturer fills out the weighted inverter efficiency form, found here: http://gosolarcalifornia.org/equipment/documents/CEC_Efficiency_Form.xls

4. The manufacturer fills out the Energy Commission equipment application form, found here: http://gosolarcalifornia.org/equipment/documents/Equipment_Request.doc

5. Email a copy of the UL 1741 Certification Letter, Weighted Inverter Efficiency Form, and the Energy Commission equipment application form to CECSolarEqp@aesc-inc.com.

The inverter eligibility list is updated monthly on the first of the month. The cut-off date for the monthly update is the 15th day of the preceding month; all documentation must be submitted before this date.

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[1] For a list of NRTLs and to view NRTL OSHA scopes, visit http://www.osha.gov/dts/otpca/nrtl/.
[2] Sandia test protocol is found here: http://www.gosolarcalifornia.org/equipment/documents/2004-11-22_Test_Protocol.pdf
[3] Sandia test guideline is found here: http://www.gosolarcalifornia.org/equipment/documents/Sandia_Guideline_2005.pdf

Meter

Meter Eligibility Listing Procedure Updated 6/2/14

The California Solar Initiative (CSI) is for all market segments with the exception of New Residential Construction. The New Solar Homes Partnership (NSHP) is for the New Residential Construction market segment.

Depending on the accuracy of the meter there are two different routes to eligibility listing:

Non-revenue grade meters:

1. The meter must be self-certified by the manufacturer to an accuracy of +/- 5%.
2. Fill out the application form and submit by email.

Revenue grade meters

1. The meter must be certified to the accuracy of +/- 2% according to all applicable ANSI C-12 testing protocols. The certificate of accuracy must be performed by an NRTL.
2. Fill out application form and submit by e-mail along with the the certificate of accuracy.

All meters:

3. The manufacturer fills out the Energy Commission equipment application form, found here: http://gosolarcalifornia.org/equipment/documents/Equipment_Request.doc
4. Submit equipment application form (and documentation if revenue grade) to CECSolarEqp@aesc-inc.com.

The meter eligibility list is updated monthly on the first of the month. The cut-off date for the monthly update is the 15th day of the preceding month; all documentation must be submitted before this date.

Performance Monitoring & Reporting Service Provider

California Solar Initiative

Performance Monitoring & Reporting Service Provider Certification

Complete each blank in the form with the company name. For questions regarding CSI Performance Monitoring & Reporting Service certification contact PG&E at 1-800-743-5000 or solar@pge.com. PG&E will share your question with the other Program Administrators.

Company Name: _____	Phone: _____
Contact: _____	Fax: _____
Address: _____	Email: _____
_____	Website: _____

Certification:

_____ certifies that it is fully compliant in all respects with the Performance Monitoring & Reporting Service (PMRS) requirements as defined in the California Solar Initiative Program (CSI) Handbook. This includes the technical requirements for data handling and reporting.

Section 5.1 - Minimum Meter Requirements

All meters or equipment provided by _____ shall meet all provisions set forth in this section (5.1.1-5.1.9).

Section 5.3 - Minimum Performance Monitoring & Reporting Capability Requirements

_____ shall provide, at minimum, the data points, all monitoring, data collection (recording), data retention, remote access, data reporting and reporting methodologies, as outlined in sub-sections 5.3.1 through 5.3.8. Specifically, _____ certifies that it shall comply, as follows:

5.3.1 Required Solar Performance / Output Data

The PMRS must monitor, record, and report on instantaneous AC kW and net kWh Generated by the PV system.

5.3.2 Minimum Report Delivery Requirements

The PMRS must provide for the electronic delivery of reports.

5.3.3 Time Granularity of Acquired Data

The PMRS must log all Required Solar Performance / Output Data points no less frequently than once every 15 minutes.

5.3.4 Frequency of Data Collection

The PMRS must remotely acquire and process all data points no less frequently than once per day.

5.3.5 Minimum Reporting Requirements

The PMRS must provide the following reports based on acquired, processed, and analyzed data:

- Data as collected and summarized by hour, day, month, and year.
- System alerts that indicate a non-functioning or poorly functioning system.

5.3.6 Frequency of Data Reporting

The PMRS must at all times provide System Owners with on-demand access to all reports required by Section 5.3.5. Time sensitive reports (i.e. System Alerts) shall be made available within 24 hours of the PMRS receiving the recorded data points which, when analyzed, indicated a problem with the system.

5.3.7 Data Retention Policy

The PMRS must retain and provide the System Owner and Program Administrator with remote access to 15 minute average data for a minimum of five years from the date of production for systems receiving PBI payments and two years from the date of production for systems receiving an EPBB program incentive.

5.3.8 Performance Data Provider Requirements

As per D.08-01-030, the element of PMRS that entails the data flow between the solar energy system and the Program Administrator that serves as the basis for PBI must, as a minimum, meet the interim CSI PBI data transfer rules (Appendix H).

Section 5.5 Eligible Recipients of Information
Subject to the Data Privacy Restrictions appearing in section 5.5.3 of the California Solar Initiative Program (CSI) Handbook, shall at minimum provide access to data as follows:

5.5.1 - System Owner and/or host site customer (if different): All Required Solar Performance/Output Data.

5.5.2 - Program Administrators: All data listed in section 5.3 for all systems.

5.5.3 - _____ agrees to comply with and abide by all Data Privacy restrictions & limitations set forth in this section.

Signature: _____ Date: _____

Print Name: _____

Title: _____

Print, sign, and e-mail completed form to:
Alternative Energy Systems Consulting, Inc. (AESC)
CECSolarEqp@aesc-inc.com

Other Solar Electric Generating Technologies

OSEGT Eligibility Listing Procedure Updated 6/2/14

Other solar electric generating technologies (OSEGTs) are defined as all technologies other than flat-plate non-concentrating photovoltaic modules. OSEGTs are only eligible for performance-based incentives (PBI) at this time.

The requirement for OSEGT eligibility is a full safety certification with follow-up service or listing by a NRTL. Simply providing recognition, evaluation, or test results will not be accepted. When certification at the product level is not available, a component level certification is required as part of the full safety certification. Field certification by a NRTL, without appropriate component-level certification, is not evidence of full safety certification.

The eligibility process for other solar electric generating technologies is as follows:

1. The manufacturer gets their product certified to a safety protocol by a NRTL as described in either option a), b), or c) below.
    a. If applicable, the manufacturer may be listed to UL 1703 by UL, CSA, or Intertek.
    b. If applicable, the manufacturer may be listed to UL SU 8703 by UL. Depending on the product, additional controls testing (e.g. UL 508A) may be necessary.
    c. Alternatively, products can also be approved via a third method, which requires an investigation to determine whether any existing standards or portions of existing standards are applicable, and/or whether development of new test protocols is necessary. Determination of applicability of existing standards and development of new test protocols must be performed by a NRTL whose OSHA scope includes UL 1703 or UL 1741. The NRTLs who can perform this determination are UL, CSA, Intertek, MET Laboratories, TUV America, and TUV Rheinland of North America.

Note: Manufacturers must submit all new test protocols developed pursuant to option c) to the Energy Commission for review. The Energy Commission reserves the right to challenge the adequacy of test protocols for purposes of eligibility listing. If inadequacies are determined, the Energy Commission will consult the NRTL and manufacturer, but may ultimately not approve the eligibility listing if inadequacies are not resolved.

2. The manufacturer fills out the Energy Commission equipment application form, found here: http://gosolarcalifornia.org/equipment/documents/Equipment_Request.doc

3. Email a copy of the NRTL Certification Letter and the Energy Commission equipment application form to CECSolarEqp@aesc-inc.com.

4. Each manufacturer of OSEGT equipment must work with the appropriate Program Administrator to determine suitable estimates of capacity and energy production prior to reservation of funds.

Although OSEGTs are only eligible for performance-based incentives at this time, estimated performance incentives may be considered in the future. Please do not contact KEMA to ask about future expected performance incentives for OSEGTs.

The OSEGT eligibility list is updated monthly on the first of the month. The cut-off date for the monthly update is the 15th day of the preceding month; all documentation must be submitted before this date.